

Study Programme: Energy and Process Engineering			
Course Unit Title: Basics of Thermodynamics			
Course Unit Code: M3221			
Name of Lecturer(s): Tomić Mladen			
Type and Level of Studies: bachelor			
Course Status (compulsory/elective): compulsory			
Semester (winter/ summer): summer			
Language of instruction: english			
Mode of course unit delivery (face-to-face/distance learning): face-to-face			
Number of ECTS Allocated: 5			
Prerequisites: none			
Course Aims: Introduction to the structure of thermodynamics, thermodynamics concepts and methods of solving energy conversion problems.			
Learning Outcomes: Acquiring basic knowledge in solving technical tasks of thermal power engineering, thermal process engineering and designing thermal machines and plants.			
Syllabus. Thermodynamic system and surroundings. Working body. Properties of state. Equilibrium, change of state, process. The zero law of thermodynamics. Ideal gas law. Conservation of energy. The concept of energy. Internal energy. Heat capacity. Mayer's equation. The first law of thermodynamics for a closed and open thermodynamic system. p-v diagram, work, and thermodynamic process in a p-v diagram. Enthalpy. The second law of thermodynamics. Reversible, irreversible and impossible process. Thermodynamic cycle. Properties of state for a thermodynamic cycle. Clockwise thermodynamic cycle. Carnot cycle. Thermal efficiency. The concept of entropy. The mathematical expression of the second principle of thermodynamics. Entropy change of ideal gases. Heat, T-s diagram, and thermodynamic process in the T-s diagram. Counter-clockwise cycles. Entropy change of a thermodynamic system. The second principle of thermodynamics for a cycle. Entropy change of an isolated thermodynamic cycle. The third principle of thermodynamics. Real gases. Determination of properties for real gases. Carnot cycle for real gases. Rankine cycles for water vapor.			
Required Reading: Relevant literature in English TBD			
Weekly Contact Hours: 2	Lectures: 2	Practical work: 2	
Teaching Methods: Lectures and auditory practice. Practice classes follow the lectures and include the advanced level of students' independence in solving assignments.			
Knowledge Assessment (maximum of 100 points):			
Pre-exam obligations	points	Final exam	points
Attendance			
Computer exercises			
Tests (4x)			

